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**CHABA**  
**FOURTH ANNUAL REPORT**  
**JUNE 1957**

Technical Report No. 10  
to the Office of Naval Research  
from the Central Institute for the Deaf  
Contract No. Nonr 1151 (31), NR 140-069

CHABA  
FOURTH ANNUAL REPORT  
OF THE  
ARMED FORCES-NATIONAL RESEARCH COUNCIL  
COMMITTEE ON HEARING AND BIO-ACOUSTICS

1 June 1956 to 31 May 1957

Prepared by

Hallowell Davis  
Donald H. Eldredge  
J. Richardson Usher  
of the  
Office of the Executive Secretary

Armed Forces-National Research Council  
Committee on Hearing and Bio-Acoustics

Office of the Executive Secretary  
Central Institute for the Deaf  
318 South Kingshighway  
St. Louis 10, Missouri

Technical Report No. 10  
to the Office of Naval Research  
Contract No. Nonr 1151 (01), NR 140-039

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### SUMMARY OF THE FOURTH ANNUAL REPORT

The Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics held one full meeting during the year covered by this report. The topic of this meeting was the review of problems and recent progress in hearing and bio-acoustics. A summary of the meeting is included in this report.

The CHABA Council met three times during the year and accepted formal or informal reports from ten Working Groups. Four new Working Groups were appointed, and three Working Groups were discharged. On 31 May, 1957, seven Working Groups had active status.

The activities of the several Working Groups are summarized in the body of this report.

## TABLE OF CONTENTS

	Page
By-Laws .....	4
Statement of Purposes and Methods of Operation .....	7
Membership List .....	11
Calendar of Meetings .....	28
Program of the Fourth Annual Meeting .....	31
Summary of the Fourth Annual Meeting .....	36
Summary of Working Group Activities .....	37
Other Activities of the Secretariat .....	43
Reports .....	46



BY-LAWS OF THE  
ARMED FORCES-NATIONAL RESEARCH COUNCIL COMMITTEE  
ON HEARING AND BIO-ACOUSTICS

1. The name of this Committee shall be the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics.
2. The purpose of this Committee shall be to consider problems of a scientific and technical nature concerning the direct and indirect effects of acoustic energy (sound, vibration and blast) on man. These problems, among others of a related nature, include:
  - a. Hearing; including auditory physiology, psycho-acoustics, auditory standards;
  - b. Communications, particularly speech communications in noise;
  - c. The psychological and social reactions of man to noise;
  - d. The auditory and non-auditory effects of high-intensity acoustic energy on man;
  - e. The means of protection against the undesirable effects of acoustic energy;
  - f. The relevant physical and engineering problems of the generation, measurement and control of acoustic energy.

In consideration of these problems, the Committee shall collect, collate, and distribute information and may recommend such action as shall be in the national interest.

3. There shall be three classes of members of this Committee: Council Members, Members and Affiliated Members.
  - a. There shall be a Council to consist of nine members appointed as follows: one representative from each of the three Armed Forces; three representatives named by the National Research Council; an Executive Secretary chosen by the other Council members; and such additional members, chosen by the Council, as are required to bring the total to nine. Members of the Council shall normally serve for three consecutive years, or until their successors have been appointed and take office.
  - b. Members of the Committee shall be such additional persons as are appointed by the Armed Forces or the National Research Council. They shall be persons qualified by the nature of their training and experience, or their employment, to contribute to the purposes of the Committee. Normally, one or two representatives of each administrative unit in the Armed Forces having direct cognizance of the problems in hearing and bio-acoustics shall be included. Others shall be engineers and scientists who are

qualified by training, experience, or employment in the fields of acoustics and vibration, psychology, physiology, or medicine. Members of the Committee shall continue to serve at the pleasure of the appointing agency. The Committee will reimburse the civilian National Research Council appointed members for expenses while serving at designated meetings.

c. Other agencies of the government having cognizance of problems in hearing and bio-acoustics, and professional and industrial organizations having similar interests, may be invited at the discretion of the Council to appoint Affiliated Members to the Committee. Except as such Affiliated Members may happen to be Members under paragraph 3b above, they serve as representatives of the agency or organization which shall have appointed them, and the appointing agency shall be responsible for their term of service, replacement, expenses while serving, etc. The appointing agency shall keep the Executive Secretary informed at all times who its authorized representative is.

4. The Council is empowered to take all actions necessary to carry out the work of the Committee except for those actions delegated to the Committee.

a. The Council shall elect a Chairman and a Deputy Chairman from its own members. The Chairman shall preside at all meetings of the Council and of the Committee and exercise the usual duties of a chairman. The Deputy Chairman shall perform the duties of the Chairman in the case of his absence or inability to serve. The term of office of the Chairman and Deputy Chairman shall be two years.

b. The Council shall select an Executive Secretary as provided under paragraph 3a above. The Executive Secretary is empowered to receive and disburse funds for the Committee, to employ technical and professional assistance, to answer routine inquiries in the name of the Committee, and to call, with the concurrence of two other members of the Council, special meetings of the Council. The Executive Secretary shall carry out such projects as the Council shall direct. He shall report on his interim activities at each regular meeting of the Council and shall prepare and distribute to the Council minutes of their meetings, and, at the direction of the Council, reports or publications of the Committee which are necessary or desirable.

c. The Council shall have two regular meetings per year at a time to be agreed upon not later than the last previous regular meeting of the Council. Special meetings may be called, as provided in paragraph 4b, upon not less than five days notice to all Council members.

d. A quorum of the Council shall consist of a majority of the qualified members. Each member of the Council may have a deputy serve in his stead at any meeting which he is unable to attend. A quorum shall require the presence of not less than three regularly appointed members of the Council.

5. The work of the Committee may be carried out in any manner approved by the Council including the following:
  - a. Meetings of the full Committee at which scientific and technical reports may be presented, or problems may be laid before the group for discussion and recommendations.
  - b. The appointment of Working Groups to consider specific issues brought to the Committee, such Working Groups to prepare their findings and recommendations for presentation to the Council.
  - c. The encouragement and sponsorship of publications and other activities which will result in the more effective distribution of our present knowledge about hearing and bio-acoustics.
6. These By-Laws may be amended by two-thirds vote of the regularly appointed members of the Council, following which the changes shall be submitted promptly to the National Research Council and to the Armed Forces for their concurrence.
7. Actions taken at the meeting of representatives of the National Research Council and of the Armed Forces, held at the Bureau of Medicine and Surgery on December 15, 1952 are ratified as enabling action in the formation of this Committee. These By-Laws shall take effect with the appointment of the first six members of the Council.

Statement of Purposes and Methods of Operation  
THE ARMED FORCES - NATIONAL RESEARCH COUNCIL COMMITTEE  
ON HEARING AND BIO-ACOUSTICS

The Armed Forces - National Research Council Committee on Hearing and Bio-Acoustics (CHABA) was organized late in 1952 to provide a group of informed consultants who could answer questions in the general area of hearing and bio-acoustics. Within its broad scope, CHABA absorbed many functions of the National Research Council's earlier Committee on Hearing. CHABA consults with and advises with the Armed Services in such general areas as:

- 1) Auditory physiology, psycho-acoustics, and auditory standards.
- 2) Communications, particularly speech communications in noise.
- 3) The psychological and social reactions of man to noise.
- 4) The auditory and non-auditory effects of high intensity acoustic energy on man (sound, vibration and blast).
- 5) The means of protection against the undesirable effects of acoustic energy.
- 6) The relevant physical and engineering problems of the generation, measurement and control of acoustic energy.

CHABA activities are supported by funds contributed equally by the Army, the Navy and the Air Force. The Secretariat and the continuing operation of the Committee are provided by the Central Institute for the Deaf under contract with the Office of Naval Research. The Office of Naval Research acts as contracting agent for the three Armed Services.

CHABA IS A RESEARCH ADVISORY ORGANIZATION. IT IS NOT A CONTRACTING AGENCY AND DOES NOT DISPENSE FUNDS. IT MAY, HOWEVER, RECOMMEND THAT RESEARCH ALONG CERTAIN LINES BE CARRIED OUT.

The Council

CHABA's activities are planned and directed by a Council composed of nine members. The Army, Navy, and Air Force each have a Representative, the National Research Council appoints three members, and three members-at-large are chosen by the Council itself. The Council also selects from its membership a Chairman and Deputy Chairman (for two year terms), and an Executive Secretary.

The Council receives the reports of CHABA Working Groups and transmits them through the Secretariat to the requesting agency, either with or without additional comment or endorsement.

The Council usually meets three times a year.

### The Committee

The full Committee on Hearing and Bio-Acoustics consists of about one hundred and twenty regular members, of which about thirty-seven are civilians appointed by the National Research Council. The latter appointments include "engineers and scientists who are qualified by training, experience, or employment in the fields of acoustics, vibrations, psychology, physiology, or medicine." Several government agencies with interests in this general area appoint about fifteen affiliated members to the Committee for liaison purposes. In appointing its committee members the National Research Council (NRC) receives suggestions from the CHABA Council but is not bound by them. The common objective is to appoint a group of members who will adequately represent the several current CHABA interests and also those which can be reasonably foreseen. The Committee is purposely kept limited in size and a policy of slow rotation of membership has been adopted.

The Committee meets annually, usually in October in the Washington area. The meetings are restricted to the actual CHABA membership, and specially invited guests, in order to preserve an intimate atmosphere of free discussion. A Committee member is expected to attend this meeting and take part in discussions of those topics in which he is an expert. Except for travel expenses in connection with attending meetings, NRC members serve without financial compensation unless they are asked to serve on one of the Working Groups.

### Working Groups

The major work performed by CHABA is accomplished by Working Groups composed of committee members, often supplemented by invited consultants or former members. Working Groups are formed to work on problems brought to the Council by the representatives of the three Armed Services. National Research Council members of the Working Groups are paid for their time spent on work in these groups and are provided travelling expenses. The Council selects the membership of these groups on the basis of the fields of knowledge which should be represented in the solution to the problem. When a Working Group has prepared its report, the Council has the responsibility of accepting and transmitting it to the requesting agency either with or without additional comment or endorsement.

### The Secretariat

The Executive Secretary and his staff provide continuity of activity between meetings of the Council. Either alone or with the advice of other specialists and subject to later endorsement by the Council, they may answer questions from the Armed Services that do not require the appointment of a Working Group. They also make the arrangements for the Committee, Council and Working Group meetings. They edit and prepare the various CHABA reports for distribution and/or publication.

The Secretariat is at present located at the Central Institute for the Deaf, 318 South Kingshighway, St. Louis 10, Missouri, and is composed of members of the staff of that institution. Under the terms of the contract with the Office of Naval Research, the Secretariat and Central Institute for the Deaf conduct the financial affairs of CHABA.

subject to the approval of the ONR Scientific Officer. Hallowell Davis, M.D., is Executive Secretary, Donald H. Eldredge, M.D., is Technical Aide, and the Secretary for the Working Groups is J. Richardson Usher, Ph.D.

#### Distribution of Reports

Working Group Reports, Reports of Annual CHABA Meetings and any other CHABA Technical Reports are prepared by the Secretariat and distributed to the CHABA membership and to a Department of Defense mailing list furnished by the Scientific Officer in the Office of Naval Research. Reports that are of sufficiently general interest usually will be published in scientific periodicals. These reports are also available for general distribution through:

Office of Technical Services  
Technical Information Branch  
Department of Commerce  
Washington, D.C.

and, for those eligible for the service, through:

Armed Services Technical Information Agency  
Document Service Center  
Knott Building  
Dayton, Ohio

#### Consulting Service

Requests for CHABA advice and questions directed to CHABA are submitted through the Armed Service Representatives on the Council. These are:

##### ARMY:

Charles S. Gersoni, Colonel, (MSC) USA  
Chief, Human Resources Research Branch  
Research and Development Division  
Office of the Surgeon General  
Department of the Army  
Washington 25, D.C.

##### NAVY:

Clifford P. Phoebus, Captain, (MC) USN  
Special Assistant for Bio Sciences  
Office of Naval Research  
Department of the Navy  
Washington 25, D.C.

##### AIR FORCE:

Paul A. Campbell, Colonel USAF (MC)  
Special Assistant for Medical Research  
Hdq., AF Office of Scientific Research  
14th and Constitution Avenue  
Washington 25, D.C.

Liaison with the National Research Council is through the Executive Secretary of the Division of Anthropology and Psychology of the National Research Council. He is:

Dr. Glen Finch  
Executive Secretary, Division of  
Anthropology and Psychology  
National Academy of Sciences-National  
Research Council  
2101 Constitution Avenue  
Washington 25, D.C.

CHABA activities are of interest to the Divisions of Physical Sciences, Medical Sciences, Anthropology and Psychology, Engineering and Industrial Research, and Biology and Agriculture of the National Research Council.



MEMBERSHIP LIST

1 June 1956 - 31 May 1957

THE COUNCIL

NRC Appointees

Dr. R. H. Bolt  
Acoustics Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

(Chairman: '53, '54;  
Deputy Chairman: '55, '56)

Dr. Gordon Hoople  
1100 East Genesee Street  
Syracuse 10, New York

(Committee: '53, '54, '55;  
Council: '56, '57, '58)

Dr. William D. Neff  
Section of Bio-Psychology  
Faculty Exchange  
University of Chicago  
Chicago 37, Illinois

(Committee: '53, '54;  
Council: '55, '56, '57)

Army Representative

Col. Charles S. Gersoni  
(MSC) USA  
Chief, Human Resources Research Branch  
Research and Development Division  
Office of the Surgeon General  
Department of the Army  
Washington 25, D.C.

(Designated: Committee;  
3 Sept. '54;  
Council; 24 Oct. '55)

Navy Representative

Capt. Clifford P. Phoebus  
(MC) USN  
Special Assistant for Bio-Sciences  
Office of Naval Research  
Department of the Navy  
Washington 25, D.C.

(Designated: Committee,  
10 Mar. '53;  
Council, 18 Oct. '54.  
Chairman, '55, '56)

Air Force Representative

Col. Paul A. Campbell  
USAF (MC)  
Special Assistant for Medical Research  
HQ., AF Office for Medical Research  
14th and Constitution Avenues  
Washington 25, D.C.

(Designated 8 Nov. '56)



Dr. Horace O. Parrack  
Address:  
Commander-  
Wright Air Development Center  
Attn: WCEDV, Dr. Horace O. Parrack  
Wright-Patterson Air Force Base, Ohio

(Designated: Feb. '53;  
Relieved 8 Nov. '56;  
Committee: 8 Nov. '56)

Alternate Council Representative:

Col. Charles H. Roadman  
USAF (MC)  
Chief, Human Factors Division  
Directorate of Research and Development  
Office, Deputy Chief of Staff  
Headquarters, United States Air Force  
Washington 25, D.C.

(Designated 16 Sept. '55)

Members at Large

Dr. Hallowell Davis  
Central Institute for the Deaf  
318 South Kingshighway  
St. Louis 10, Missouri

(Executive Secretary, '53,  
'54, '55, '56, '57, '58)

Prof. Walter A. Rosenblith  
Acoustics Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

(Committee: '53, '54;  
Council: '55, '56)

Dr. T. L. K. Smull  
National Advisory Committee  
on Aeronautics  
1215 H Street, N.W.  
Washington 25, D.C.

(NACA Affiliate Member, from  
22 June '53;  
Council, '55, '56, '57)

Technical Aide

Dr. Donald H. Eldredge  
Central Institute for the Deaf  
318 South Kingshighway  
St. Louis 10, Missouri

(February, 1953)

NRC Liaison Officer

Dr. Glen Finch  
Executive Secretary  
Division of Anthropology and Psychology  
National Academy of Sciences-  
National Research Council  
2201 Constitution Avenue  
Washington, D.C.

ONR Scientific Officer

Dr. Richard Trumbull  
Head, Physiological Psychology Branch  
Office of Naval Research  
Department of the Navy  
Washington 25, D.C.

(Designated 15 Nov. '54)

Secretary to the Working Groups

Dr. J. Richardson Usher  
Central Institute for the Deaf  
818 South Kingshighway  
St. Louis 10, Missouri

(October, 1955)

THE COMMITTEE

National Research Council Appointed Members

(One year appointments,  
beginning with 1 July)

Dr. Harlow Ades  
Department of Anatomy  
The University of Texas  
Southwestern Medical School  
5323 Harry Hines Blvd.  
Dallas 19, Texas

('55, '56)

Dr. Leo L. Beranek  
Bolt, Beranek and Newman  
100 Eliot Street  
Cambridge 38, Massachusetts

('55, '56)

Dr. Raymond Carhart  
School of Speech  
Northwestern University  
Evanston, Illinois

('53, '54, '55, '56)

Dr. Robert O. Fehr  
General Engineering Company  
General Electric Company  
One River Road  
Schenectady 5, New York

('53, '54, '55, '56)

Dr. Harvey Fletcher  
Director of Research  
Ralph M. Young University  
Provo, Utah

(Council: '53, '54, '55;  
Committee: '56)

Dr. Edmund P. Fowler, Jr.  
Department of Otolaryngology  
College of Physicians and Surgeons  
Columbia University  
600 W. 168th Street  
New York 32, New York

('56)

Dr. Wendell R. Garner  
Department of Psychology  
The Johns Hopkins University  
Baltimore 18, Maryland

('54, '55, '56)

THE COMMITTEE  
National Research Council Appointed Members

(One year appointments,  
beginning with 1 July)

Dr. Aram Glorig  
111 North Bonnie Brae  
Los Angeles 26, California

(Army Council Representative:  
11 Mar. '53 to 15 Dec. '54;  
NRC member: '55, '56)

Dr. Ward Halstead  
Department of Medicine  
University of Chicago  
Chicago 37, Illinois

('55, '56)

Dr. Thrift G. Hanks  
Medical Director  
Boeing Airplane Company  
Seattle 24, Washington

('56)

Dr. Howard C. Hardy  
322 West Washington Street  
Chicago 6, Illinois

('56)

Mr. John K. Hilliard  
Altec-Lansing Corporation  
9356 Santa Monica Blvd.  
Beverly Hills, California

('56)

Dr. Ira J. Hirsh  
Central Institute for the Deaf  
818 South Kingshighway  
St. Louis 10, Missouri

('55, '56)

Dr. Frederick V. Hunt  
Division of Engineering and Applied Physics  
Harvard University  
Cambridge 39, Massachusetts

('56)

Dr. Uno Ingard  
Acoustics Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

('56)

Dr. Lloyd A. Jeffress  
Defense Research Laboratory  
The University of Texas  
Austin 12, Texas

('56)

Dr. J. C. R. Licklider  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

('54, '55, '56)

Dr. John R. Lindsay  
Department of Surgery  
The University of Chicago  
950 East 59th Street  
Chicago 37, Illinois

('53, '54, '55, '56)

THE COMMITTEE  
National Research Council Appointed Members

(One year appointments,  
beginning with 1 July)

Dr. George A. Miller  
Psychological Laboratories  
Memorial Hall  
Harvard University  
Cambridge 38, Massachusetts

('53, '54, '55, '56)

Dr. W. A. Munson  
Bell Telephone Laboratories, Inc.  
Whippany, New Jersey

('53, '54, '55, '56)

Dr. Edwin B. Newman  
Psychological Laboratories  
Memorial Hall  
Harvard University  
Cambridge 38, Massachusetts

(Council, '53, '54;  
Committee, '55, '56)

Dr. Gordon E. Peterson  
Speech Clinic  
University of Michigan  
1007 East Huron Street  
Ann Arbor, Michigan

('55, '56)

Dr. Wayne Rudmose  
Southern Methodist University  
Dallas 5, Texas

('54, '55, '56)

Dr. Isadore Rudnick  
Department of Physics  
University of California  
Los Angeles 24, California

('53, '54, '55, '56)

Mr. Vincent Salmon  
Manager, Sonics Section  
Department of Physics  
Stanford Research Institute  
Menlo Park, California

('56)

Dr. Newell D. Sanders  
Chief, Physics Division  
Lewis Flight Propulsion Laboratory  
21000 Brookpark Road  
Cleveland 11, Ohio

('56)

Dr. Harold F. Schuknecht  
Henry Ford Hospital  
Detroit 2, Michigan

('55, '56)

Dr. Arnold M. Small  
Chief, Human Factors, Reliability and Acoustics  
Convair Aircraft Corporation  
San Diego 12, California

('56)

THE COMMITTEE  
National Research Council Appointed Members

(One year appointments,  
beginning with 1 July)

Dr. Kenneth N. Stevens  
Acoustics Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

('56)

Dr. S. S. Stevens  
Psycho-Acoustics Laboratory  
Memorial Hall  
Harvard University  
Cambridge 38, Massachusetts

('53, '54, '55, '56)

ARMY DESIGNATED MEMBERS

Major James P. Albrite, (MC) USA  
Director, Audiology and Speech  
Correction Center  
Walter Reed Army Medical Center  
Washington 12, D.C.

(Designated: Council, 4 Jan. '55,  
Relieved 24 Oct. '55;  
Committee, 24 Oct. '55)

Dr. Ben Ami Blau  
Human Engineering Laboratory  
Aberdeen Proving Ground, Maryland

(Designated 1 Aug. '55,  
Relieved 5 May '57)

Dr. Robert A. Butler  
Audiology and Speech Correction Center  
Walter Reed Army Medical Center  
Washington 12, D.C.

(Designated 31 Mar. '55)

Dr. R. L. Cramer  
Army Medical Research Laboratory  
Fort Knox, Kentucky

(Designated 25 Nov. '55)

Capt. John L. Fletcher, (MSC) USA  
Psychology Department  
Army Medical Research Laboratory  
Fort Knox, Kentucky

(Designated 25 Nov. '55)

Dr. Robert Galambos  
Neuropsychiatry Division  
Army Medical Service Graduate School  
Walter Reed Army Medical Center  
Washington 12, D.C.

(NRC Member '53, '54;  
Army Member '55)

Dr. Henry F. Gaydos  
QM Research and Development Command  
Natick, Massachusetts

(Designated 10 Aug. '56)

Alternate:  
Dr. Warren H. Teichner  
QM Research and Development Command  
Natick, Massachusetts

(Designated 10 Aug. '56)

# ARMY DESIGNATED MEMBERS

Colonel John R. Hall, Jr., (MC) USA (Designated 27 Sept. '55)  
 Chief, Occupational Health Branch  
 Preventive Medicine Division  
 Office of the Surgeon General  
 Room 2522, Main Navy Building  
 Washington 25, D.C.

Dr. Howard W. Hembree (Designated 2 Mar. '55;  
 QM Research and Development Command Relieved 10 Aug. '56)  
 Natick, Massachusetts

Dr. Merle L. Lawrence (Designated 28 Sept. '56)  
 Institute of Industrial Health  
 University of Michigan  
 4506 Kresge Medical Research Bldg.  
 Ann Arbor, Michigan

Dr. Nicholas B. Louis (Designated 11 Mar. '53;  
 Human Research Unit No. 1, CONARC Relieved 3 Sept. '54;  
 The Armored Center Designated 29 Oct. '56)  
 Fort Knox, Kentucky

Col. C. B. Meador (MC) USA (Designated 25 Nov. '55)  
 Office of the Chief, Physical Standards  
 Professional Division  
 Office of the Surgeon General  
 Department of the Army  
 Washington 25, D.C.

Dr. David McK. Rioch (Designated 28 Dec. '53)  
 Technical Director, Neuropsychiatry Division  
 Army Medical Service Graduate School  
 Walter Reed Army Medical Center  
 Washington 12, D.C.

Dr. Leonard S. Rubin (Designated 31 Mar. '55)  
 Chemical Corps Medical Laboratories  
 Edgewood Arsenal, Maryland

Dr. R. Edwin Shutts (Designated 4 Jan. '55)  
 Chief Supervisor,  
 Audiology and Speech Correction Center  
 Walter Reed Army Medical Center  
 Washington 12, D.C.

Lt. Col. Franklin Spann (MC) USA (Designated 4 Jan. '55;  
 Chief, ENT Service Relieved 31 Aug. '56)  
 Walter Reed Army Hospital  
 Washington 12, D.C.

Dr. Philip I. Sperling (Designated 24 Oct. '56)  
 Human Resources Branch  
 Research and Development Division  
 Department of the Army  
 Washington 25, D.C.

# ARMY DESIGNATED MEMBERS

Dr. Robert Y. Walker (Designated 25 Nov. '55)  
Chief, Psychology Department  
Army Medical Research Laboratory  
Fort Knox, Kentucky

Dr. John Weisz (Designated 5 May '57)  
Human Engineering Laboratory  
Aberdeen Proving Ground, Maryland

Mr. Maurice B. Whitlock, Jr. (Designated 31 Mar. '55)  
Audiology and Speech Correction Center  
Walter Reed Army Medical Center  
Washington 12, D.C.

## AIR FORCE DESIGNATED MEMBERS

Lt. Col. John E. Boyson USAF (MC) (Designated 9 May '53)  
Office of the Air Surgeon (MCD) Relieved 24 Sept. '56  
Hq., Air Materiel Command  
Wright-Patterson Air Force Base, Ohio

Dr. Charles W. Bray (Designated 9 May '53)  
Hq., Human Resources Research Center  
Attn: DCS/O  
Lackland Air Force Base  
San Antonio, Texas

Mr. Francis A. Brogan (Designated 7 July '53)  
USAF School of Aviation Medicine  
Randolph Air Force Base  
Randolph Field, Texas

Deputy Member:  
Col. Henry M. Sweeny USAF (Designated 9 May '53)  
USAF School of Aviation Medicine  
Randolph Air Force Base  
Randolph Field, Texas

Col. J. C. Carmichael USAF (MC) (Designated 21 Sept. '55)  
Hq., Air Materiel Command, Attn: MCDPE  
Wright-Patterson Air Force Base, Ohio

Dr. Julien Christensen (Designated 9 May '53)  
Address:  
Commander  
Wright Air Development Center  
Attn: WCRDP, Dr. Julien Christensen  
Wright-Patterson Air Force Base, Ohio

AIR FORCE DESIGNATED MEMBERS

Deputy Member:

Dr. Harry J. Jerison

(Designated 10 Oct. '54)

Address:

Commander

Wright Air Development Center

Attn: WCRDP, Dr. Harry J. Jerison

Wright-Patterson Air Force Base, Ohio

Mr. D. A. Dickey

(Designated 9 May '53)

Address:

Commander

Wright Air Development Center

Attn: WCLB, Mr. D. A. Dickey

Wright-Patterson Air Force Base, Ohio

Deputy Member:

Mr. Allan Watton, Jr.

(Designated 9 May '53)

Address:

Commander

Wright Air Development Center

Attn: WCLBS, Mr. Allan Watton, Jr.

Wright-Patterson Air Force Base, Ohio

Col. G. K. Fair USAF

(Designated 9 Sept. '55)

Chief, Aviation Medicine Division

Office of the Surgeon General

Hq., United States Air Force

Washington 25, D. C.

Col. Jay F. Gamel

(Designated 24 Sept. '53)

Office of the Surgeon (MCD)

Hq., Air Materiel Command

Wright-Patterson Air Force Base, Ohio

Dr. H. E. von Gierke

(Designated 9 May '53)

Address:

Commander

Wright Air Development Center

Attn: WCRDN, Dr. H. E. von Gierke

Wright-Patterson Air Force Base, Ohio

Deputy Member:

Major Elizabeth Guild USAF

(Designated 9 May '53)

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Commander

Wright Air Development Center

Attn: WCRDN, Major Elizabeth Guild

Wright-Patterson Air Force Base, Ohio



AIR FORCE DESIGNATED MEMBERS

Dr. Frank W. Hartman (Designated 31 July '56)  
Medical Research Advisor, AFCSG-10.2  
Directorate of Professional Services  
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Dr. A. W. Hetherington (Designated 9 May '53)  
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Deputy Member:  
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Hq., Air Research and Development Command Relieved 6 July '56)  
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State University of Iowa  
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Lt. Col. Ralph N. Kraus USAF (Designated 30 June '55)  
USAF School of Aviation Medicine  
Randolph Air Force Base  
Randolph Field, Texas

Dr. Karl Kryter (Designated 9 May '53)  
AF. Operational Applications Laboratory  
Air Force Cambridge Research Center  
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Dr. Irwin Pollack (Designated 9 May '53)  
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# AIR FORCE DESIGNATED MEMBERS

<p>Lt. Col. Alvin F. Meyer, Jr.            USAF (MC)            Office of the Surgeon            Hq., Strategic Air Command            Offutt Air Force Base, Nebraska</p>	(Designated 9 May '53)
<p>Mr. C. M. Michaels            Address:            Commander            Wright Air Development Center            Attn: WCLPO, Mr. C. M. Michaels            Wright-Patterson Air Force Base, Ohio</p>	(Designated 24 Sept. '56)
<p>Major Richard K. Miller USAF            Chief, Aircrew Standards Branch            Physical Standards Division            Office of the Surgeon General            Hq., United States Air Force            Washington 25, D. C.</p>	<p>(Designated 9 Sept. '55;            Relieved 24 Sept. '56)</p>
<p>Lt. Col. C. N. Moss USAF (MC)            Industrial Medical Officer            Preventive Medicine Division            Office of the Surgeon General            Hq., United States Air Force            Washington 25, D. C.</p>	(Designated 9 Sept. '56)
<p>Dr. Horace O. Parrack            Address:            Commander            Wright Air Development Center            Attn: WCRDV, Dr. Horace O. Parrack            Wright-Patterson Air Force Base, Ohio</p>	<p>(Designated Council: Feb. '53;            Relieved 8 Nov. '56.            Designated Committee:            8 Nov. '56)</p>
<p>Lt. Col. John F. Pierce USAF            Preventive Medicine Division            Office of the Surgeon General            Hq., United States Air Force            Washington 25, D. C.</p>	(Designated 21 Sept. '56)
<p>Mr. Edward Poth            Sanitary and Industrial Hygiene Engineering Branch            USAF Dispensary            Kelly Air Force Base            San Antonio, Texas</p>	(Designated 9 May '53)
<p>Dr. O. R. Rogers            Address:            Commander            Wright Air Development Center            Attn: WCLSY, Dr. O. R. Rogers            Wright-Patterson Air Force Base, Ohio</p>	(Designated 9 May '53)

## AIR FORCE DESIGNATED MEMBERS

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Address:  
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Capt. E. C. Simpson USAF (Designated 9 May '53;  
Relieved 24 Sept. '56)  
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Attn: WCLPO-1; Capt. E. C. Simpson  
Wright-Patterson Air Force Base, Ohio

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Mr. Weiant Wathen-Dunn (Designated 9 May '53)  
Air Force Cambridge Research Center  
L. G. Hanscom Field  
Bedford, Massachusetts

## NAVY DESIGNATED MEMBERS

Mr. Wilbert Annis (Designated 18 Mar. '53;  
Relieved 23 Aug. '56)  
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Earth Sciences Division  
Office of Naval Research  
Department of the Navy  
Washington 25, D. C.

Capt. Norman L. Barr (MC) USN (Designated 4 June '56)  
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Potomac Annex  
Washington 25, D. C.

Dr. John W. Black (Designated 16 Mar. '53)  
Department of Speech  
Ohio State University  
Columbus Ohio  
(U. S. Naval School of Aviation Medicine  
U. S. Naval Air Station  
Pensacola, Florida

## NAVY DESIGNATED MEMBERS

Alternate:  
Dr. Gilbert Tolhurst (Designated 24 Nov. '54)  
U. S. Naval School of Aviation Medicine  
U. S. Naval Air Station  
Pensacola, Florida

Dr. J. T. Dailey (Designated 29 Jan. '53)  
Technical Director, Research Division  
Bureau of Naval Personnel  
Department of the Navy  
Washington 25, D. C.

Alternate:  
Mr. Victor Fields (Designated 29 Jan. '53)  
Assistant Head, Classification and Survey Research Branch  
Bureau of Naval Personnel  
Department of the Navy  
Washington 25, D. C.

Mr. William J. Finney (Designated 11 Mar. '53)  
Naval Research Laboratory  
Washington 25, D. C.

Dr. Robert S. Gales (Designated 5 Mar. '53)  
Head, Psychophysics Branch  
Human Factors Division  
U. S. Navy Electronics Laboratory  
San Diego 52, California

Lt. Cdr. David E. Goldman (MSC) USN (Designated 11 Mar. '53)  
Scientific Liaison Officer  
Office of Naval Research  
Navy 100, Box 39  
Fleet Post Office, New York, N. Y.

Cdr. Alan D. Grinstead (MSC) USN (Designated 19 Sept. '55)  
Aviation Medicine Division, Code 537  
Bureau of Medicine and Surgery  
Department of the Navy  
Washington 25, D. C.

Dr. Fred Harbert (Designated 13 Dec. '55)  
Professor of Otolaryngology  
Jefferson Medical College  
1025 Walnut Street  
Philadelphia 7, Pennsylvania

Dr. J. Donald Harris (Designated 11 March '53)  
Head, Sound Branch, Research Division  
U. S. Naval Medical Research  
U. S. Naval Submarine Base  
New London, Connecticut

NAVY DESIGNATED MEMBERS

Alternate:

Dr. Richard H. Ehmer (Designated 27 Oct. '55)  
U. S. Naval Medical Research Laboratory  
U. S. Naval Submarine Base  
New London, Connecticut

Mr. John F. Hyland (Designated 5 July '56)  
Bureau of Ships (Code 565E)  
Department of the Navy  
Washington 25, D. C.

Alternate:

Mr. Walter K. Dau (Designated 11 Oct. '54)  
Ship Technical Division  
Bureau of Ships (Code 565E)  
Department of the Navy  
Washington 25, D. C.

Cdr. W. L. Jones (MC) USN (Designated 13 Jan. '56)  
Room 1 W45, "W" Building  
Department of the Navy  
Washington 25, D. C.

Mr. Morris Lindman (Designated 8 Feb. '56;  
Bureau of Ships, Code 371 Relieved 5 July '56)  
Department of the Navy  
Washington 25, D. C.

Mr. Emanuel S. Mendelson (Designated 11 Mar. '53)  
Head, Human Engineering Division  
Naval Air Materiel Center, NAES  
Philadelphia 12, Pennsylvania

Mr. Aubrey W. Pryce (Designated 23 Aug. '56)  
Head of Acoustics Branch (Code 411)  
Earth Sciences Division  
Office of Naval Research  
Washington 25, D. C.

Dr. Clifford P. Seitz (Designated 2 April '53)  
Special Devices Center  
Sands Point  
Port Washington, New York

Capt. L. B. Shone USN (Designated 20 July '55)  
Preventive Medicine Division  
Bureau of Medicine and Surgery  
Department of the Navy  
Washington 25, D. C.

## NAVY DESIGNATED MEMBERS

Cdr. J. Siegel (MSC) USN  
Preventive Medicine Division  
Bureau of Medicine and Surgery  
Department of the Navy  
Washington 25, D. C.

(Designated 20 July '55)

Dr. John C. Webster  
U. S. Navy Electronics Laboratory  
San Diego 52, California

(Designated 27 April '56)

## AFFILIATED MEMBERS

<u>Organization</u>	<u>Member</u>	<u>Appointment date</u>
British Joint Services Mission	Surgeon Cdr. Frank P. Ellis, RN British Joint Services Mission Medical Staff, Room 5302, Bldg. 5 Bureau of Medicine and Surgery Potomac Annex Department of the Navy Washington 25, D. C.	(13 July '54)
	Wing Cdr. E. Bruce Harvey British Joint Services Mission Air Force Staff 1800 K Street, NW Washington, D. C.	(23 Mar. '54 to 1 April '57)
	Wing Cdr. J. Howitt British Joint Services Mission Air Force Staff 1800 K Street, NW Washington, D. C.	(1 April '57)
Canadian Defence Research Board	Dr. W. J. McNally 1509 Sherbrooke Street West Montreal 25, Quebec, Canada	(31 May '55)
	Alternate: Dr. Keith K. Neely Defence Research Medical Laboratories P. O. Box 62, Postal Station K Montreal 25, Quebec, Canada	(31 May '55)
Canadian Joint Staff	Wing Cdr. R. F. Lowry Staff Officer, Medical Services (Air) Canadian Joint Staff 2450 Massachusetts Avenue, NW Washington 8, D. C.	(9 Feb. '54)

# AFFILIATED MEMBERS

<u>Organization</u>	<u>Member</u>	<u>Appointment date</u>
Civil Aeronautics Administration	Mr. Malcolm Y. McCormick Department of Commerce Civil Aeronautics Administration Washington, D. C.	(22 July '53)
	Alternate: Mr. S. H. Rolle Power Plant Branch Civil Aeronautics Administration Washington, D. C.	(22 July '53)
Civil Aeronautics Board	Mr. John M. Chamberlain Director, Bureau of Safety Regulation Civil Aeronautics Board Washington 25, D. C.	(11 June '53)
Federal Housing Authority	Mr. Marshall L. Ware Chief, Home Mortgage and Subdivision Unit Room 1005, Lafayette Bldg. 811 Vermont Avenue Washington 25, D. C.	(28 Feb. '57)
National Advisory Committee for Aeronautics	Dr. T. L. K. Smull National Advisory Committee for Aeronautics 1512 H Street NW Washington 25, D. C.	(22 June '53; Council, '55, '56, '57)
National Bureau of Standards	Dr. Richard K. Cook National Bureau of Standards Washington 25, D. C.	(12 June '53)
National Institute of Neurological Diseases and Blindness	Dr. Henry A. Imus National Institute of Neurological Diseases and Blindness Bethesda 14, Maryland	(25 Sept. '54; Navy Council Rep. 2/17/53 to 10/18/54)
U. S. Atomic Energy Commission	Mr. Leon A. Tarbox Engineering Branch Division of Construction and Supply U. S. Atomic Energy Commission 1901 Constitution Avenue NW Washington 25, D. C.	(17 Sept. '56)

# AFFILIATED MEMBERS

<u>Organization</u>	<u>Member</u>	<u>Appointment date</u>
U. S. Public Health Service, BUREAU OF STATE SERVICES	Mr. Charles D. Yaffee Occupation Health Field Hqs., U. S. Public Health Service 1014 Broadway Cincinnati, Ohio	(21 Sept. '55)
	Alternate: Mr. Edward Weiss Occupational Health Field Hqs., U. S. Public Health Service 1014 Broadway Cincinnati, Ohio	(28 Sept. '55)
Veterans Administration	Dr. Bernard M. Anderman Director, Physical Medicine and Rehabilitation Services Veterans Administration Washington 25, D. C.	(16 Oct. '56)



## CALENDAR OF MEETINGS

7-8 June 1956	Twelfth Council Meeting
29 & 31 October 1956	Thirteenth Council Meeting
30-31 October	Fourth Annual Committee Meeting
28-29 January 1957	Fourteenth Council Meeting

### Summary of Council Meetings

Twelfth Council Meeting: 7-8 June 1956, Cambridge, Massachusetts.

Final reports of Working Groups 21 and 24 were approved and the Working Groups were discharged. The Council noted that Working Groups 22 and 25 would meet on the succeeding days. The Council accepted a progress report from Working Group 26 on the program for the Fourth CHABA Meeting. Dr. J. Zwislocki had recommended that the development of a standard method for measurement of the attenuation of ear protectors on artificial ears would not be desirable at this time. Accordingly, Working Group 27 was discharged without having been fully organized. Dr. Newman personally reported on the difficulties he had encountered in finding social psychologists with time to devote to Working Group 28. The Council encouraged Dr. Newman to continue his efforts and reaffirmed the importance of the problem.

The Council approved the additions and changes made in the documents to be used to transmit the Reports of Working Group 14 to the Navy and recommended Category 2 distribution.

Reprinting of the BENOX Report was considered, but decided against since the report of the Fourth CHABA Meeting could be expected to supersede much of the BENOX Report information.

The Executive Secretary was asked to:

1. make special note, for the benefit of the Council, of information available to him on the problems of Workmen's Compensation for hearing loss as a result of noise exposure;

2. invite the Atomic Energy Commission and the Veterans' Administration to designate affiliate members; and

3. explore the possibility of having a CHABA column in NOISE CONTROL in which CHABA publications can be listed and reviewed.

The Council discussed the part played by Working Groups in educating the Armed Services members of CHABA. The Council agreed that it was important to recognize the somewhat different functions of CHABA as:

1. giving of known answers,
2. deriving answers from known data, and
3. explaining answers.

All of these functions appear in each Working Group task in varying proportions and occasionally compete for attention in a way that may impair the efficiency of the Working Group. Although several measures to minimize this competition were discussed and may be tried, the Council recognized that no formal changes in the Working Group structure, as presently used, would result in a uniform improvement.

A partial draft of a "Three Year Review of CHABA Activities" was reviewed by the Council and approved in principle, but was given low priority in respect to other work in progress.

The Council voted to hold one meeting each year at some field activity or military installation at which operations in noise present a practical problem.

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Thirteenth Council Meeting: 29 and 31 October, 1956, Washington, D.C.

The Council accepted interim reports from Working Groups 22 and 25, and accepted the program for the Fourth CHABA Meeting as the final report of Working Group 26. W.G. 26 was discharged.

In response to an inquiry from Dr. Newman, the Council noted that the task of Working Group 28 included the preparation of statements concerning: 1) the degree to which the Air Force research program on Community Noise was designed to meet both the implicit and the explicit goals found in the statement of requirements for this program; and 2), on the degree to which the present rate of work coincides with the stated urgency of the problem.

Drs. Davis and Trumbull reported that Government regulations will not permit the wide distribution of reports that has been previously made. Instead CHABA will try to have many of its reports appear in appropriate journals. Other reports will be duplicated or printed in smaller issues as required by the contract between ONR and the Central Institute for the Deaf.

The Council discussed the adequacy of the services which CHABA has been providing the Armed Forces. Each Service Representative expressed the opinion that CHABA is meeting a definite need and doing nearly all that could reasonably be expected.

Dr. Parrack announced that Air Force Regulation 160-3, "Hazardous Noise Exposures," which embodies many recommendations from Working Groups 21, 22, and 25, was being printed and would be ready for distribution during the CHABA meeting.

The Council discussed the need for a compilation of information about instruments for the measurement and generation of high intensity sound (above 135 db) that are presently available either commercially or in private laboratories. The Council decided to ask a new Working Group to attempt such a compilation, and W.G. 29 was authorized.

Dr. Parrack requested an annual evaluation of the status of research on methods for reducing the noise from jet engines in flight. Dr. Smull was asked to form a new Working Group (W.G. 30), and to make this evaluation early in 1957. Dr. Smull was Chairman of Working Group 27, which had prepared the previous evaluation.

Fourteenth Council Meeting: 28-29 January 1957, Washington, D.C.

Col. Paul A. Campbell, USAF (MC) was welcomed as the new Air Force Council Representative, replacing Dr. H. O. Parrack, who has been designated as Technical Advisor to the Air Force Council Representative. Professor Rosenblith reported that the final report of Working Group 22 was in the early stages of preparation. Dr. Davis announced that the final report of Working Group 25 was nearing finished form, and that after acceptance by the Council it would be submitted for publication in the Archives of Industrial Medicine.

The Council discussed several aspects of the Air Force Community Noise program in order to help Working Group 28 evaluate the importance of the program to the Air Force. Four members of the FHA Washington office visited the Council meeting and explained how they handle problems concerning loans on real property located around airports.

The Council agreed to ask Dr. Beranek, Chairman of Working Group 29, to submit the draft of his final report to Dr. Davis in time for presentation to the next Council meeting. A similar request was directed to Dr. Small, Chairman of Working Group 30.

The Council discussed various possibilities for the program of the Fifth Annual CHABA Meeting in October 1957. It was suggested that Dr. Eldredge, Chairman of Working Group 31, explore the possibilities of a program that would show what are the newest concepts in several areas that are of interest to CHABA.

At the request of Col. C. S. Gersoni, Army Council Representative, Working Group 32 was appointed to study the problem of exposure criteria for impulse type noises.

The Council, after much discussion, declined a proposal by the Institute for Applied Experimental Psychology at Tufts University to provide bibliographic reference services to CHABA. The action was based primarily upon the nonavailability of funds. In connection with financial matters, Dr. Trumbull advised the Council that, although CHABA had requested more funds for the next fiscal year the Armed Services had not been able to increase their allotments. Dr. Davis remarked that this would set a limit to the amount of Working Group activity that would be possible.

Dr. Davis announced that the Army, Navy, Air Force, and the National Research Council had approved the change in paragraph 2 of the By-Laws. The By-Laws are therefore amended. The revised paragraph, which describes the purposes for which CHABA was formed, more clearly delimits the areas of CHABA interest and explains them in greater detail.

Tuesday, October 30

0900 Welcome Detlev W. Bronk President, National Academy of  
Sciences - National  
Research Council

Panel Chairman  
Clifford P. Phoebus, Capt. (MC) USN

Major General Silas B. Hays, MC, USA  
Surgeon General, Army

Brig.General Marvin C. Demler, USAF  
Deputy Commander, Research and  
Development, Air Research and  
Development Command

Rear Admiral Rawson Bennett, II, USN  
Chief of Naval Research

# COMMUNICATION IN NOISE

Panel Chairman  
George A. Miller, Harvard University

Edwin B. Newman  
Harvard University

John C. Webster  
U. S. Navy Electronics Laboratory

What Are the Limits of "SIL" Karl D. Kryter  
for Predicting the Effective- Air Force Operational  
ness of Speech Communication Applications Laboratory  
in Noise?

Ira J. Hirsh  
Central Institute for the Deaf

What Are the limitations  
and/or the Advantages for  
Communication in Noise  
Attending Various Degrees  
and Types of Hearing  
Impairment?

Raymond Carhart  
Northwestern University

What Is the Status of Research  
on Message Communication  
Procedures to Combat High-  
Level Noise?

Irvin Pollack  
Air Force Operational  
Applications Laboratory

#### Discussants

Leo L. Beranek  
John W. Black  
J.C.R. Licklider

Bolt, Beranek and Newman, Inc.  
Ohio State University  
Massachusetts Institute of Tech.

1445-1700    The two following panels will convene together  
because they share many problems.

#### EFFECTS ON MAN AND ANIMALS OF BLAST, MECHANICAL VIBRATION AND SHOCK

##### Panel Chairman

Colonel Charles S. Gersoni, MSC, USA, Office of the  
Surgeon General, Army

Effects of Low Frequency  
Mechanical Vibration

David E. Goldman  
Lt.Cdr., (MSC) USN  
Scientific Liaison Officer  
Office of Naval Research

Status of Research on Human  
Vibration Tolerance

W. J. Gannon, Capt., USAF  
Wright Air Development Center

The Effects of Mechanical  
Vibration on Structures of  
the Inner Ear

Merle Lawrence  
University of Michigan

Effects of Blast on Animals

W. C. Blair  
Human Engineering Laboratory  
Aberdeen Proving Ground

Physiological Effects of  
Mechanical Vibration

Robert Y. Walker  
Army Medical Research Laboratory

NON-AUDITORY EFFECTS  
OF NOISE

Panel Chairman  
William D. Neff, University of Chicago

Non-Auditory Effects of High-Intensity Sound on Deaf Human Subjects      Harlow W. Ades  
Southwestern Medical School  
University of Texas

Status of a Study of the Auditory and Non-Auditory Effects of High-Intensity Noise on Aircraft Carriers      Hallowell Davis  
Central Institute for the Deaf

Discussants

William J. Gannon, Capt. USAF      Aero Medical Laboratory  
Harry J. Jerison      Aero Medical Laboratory  
Ward C. Halstead      University of Chicago

Wednesday, October 31

0900-1015

EAR PROTECTION

Panel Chairman  
Horace O. Parrack, Aero Medical Laboratory

What are the factors, apart from the psycho-physical test methods employed, that must be considered in standardizing procedures for the evaluation of devices designed to protect the ear from noise?      Ira J. Hirsch  
Central Institute for the Deaf

What is the current status of development of "noise excluding" ear protectors with respect to effectiveness of noise exclusion and acceptance by users? Can the results of operational suitability tests be correlated with laboratory evaluations?      John L. Fletcher  
Capt., MSC, USA  
Army Medical Research Laboratory

In evaluating ear protective devices the shift of the hearing threshold produced by the devices is interpreted as a "measure of attenuation." Are we justified in using this "measure" when the wearer is exposed to noise levels above 120 db?      Robert S. Gales  
U. S. Navy Electronics Laboratory

What is the present state of our knowledge concerning theoretical and experimental limitations on the effectiveness of ear protectors that have been developed according to current design approaches? Do any of the data on the limitations of effectiveness suggest new research that should be undertaken to provide improved approaches for future use?

Charles W. Nixon  
Aero Medical Laboratory

1031-1145

CONSERVATION OF HEARING

Panel Chairman  
Hallowell Davis, Central Institute for the Deaf

Hearing Conservation Data and Procedures

Robert O. Fehr  
General Electric Company

Conservation of Hearing in Noise

Aram Glorig  
Subcommittee on Noise in Industry

Criteria for Hazardous Noise Exposures

Walter A. Rosenblith  
Massachusetts Institute of Tech.

Individual Audiometric Criteria in Relation to Job Assignment in Noise

Gordon D. Hoople  
University of Syracuse

1345-1630

NOISE SOURCES AND SUPPRESSION

Panel Chairman  
Richard H. Bolt, Massachusetts Institute of Technology

Introductory Remarks and Outline of Scope of Panel

T. L. K. Smull  
National Advisory Committee for Aeronautics

Air Base Noise Surveys

Henning E. von Gierke  
Aero Medical Laboratory

Propeller Noise

A. A. Regier and Harvey H. Hubbard  
NACA, Langley Aeronautical Laboratory

Jet Noise Characteristics

Ira Dyer  
Bolt, Beranek and Newman, Inc.

Jet Noise Control on the Ground

Robert O. Fehr  
General Electric Company

**Jet Engine Modifications to  
Reduce Noise**

**Newell Sanders**  
NACA, Lewis Flight Propulsion  
Laboratory

**Boundary Layer Noise**

**Newell Sanders and Harvey H.  
Hubbard**

**Sonic Boom**

**Henning E. von Gierke**

**Noise from Manufacturing and  
Operating Equipment**

**Leo L. Beranek**  
Bolt, Beranek and Newman, Inc.

**Sources of Noise in an  
Armored Division**

**John L. Fletcher**  
Capt., MSC, USA  
Army Medical Research Laboratory



## B. Summary of the Fourth CHABA Meeting

The Fourth CHABA Meeting was held at the National Academy of Sciences Building, Washington, D.C. on 30-31 October 1956. The theme for the meeting was "A Review of Problems and Recent Progress in Hearing and Bio-Acoustics." Following an introductory panel entitled "Bio-Acoustic Problems of Particular Importance to the Armed Forces," six panels reported on and discussed six areas of interest. The nature of these presentations may be summarized as follows:

### 1. Communication in Noise

This panel summarized the basic limitations of communication in noise as we know them after some three decades of study, and described ways in which present research is trying to work around these limitations. It appears that acceptance of greater limitations in some dimensions of the communication of information will allow at least partial circumvention of other limitations. These possibilities may be generalized under modern communication theory but, often, lack of an organized knowledge of critical operational requirements prevents the most efficient application of present theory. Furthermore, the "margin of safety" is so small that different operational requirements may require quite different compromises among the communication limits that might theoretically be recommended for most efficient operation in noise.

### 2. Effects on Man and Animals of Blast, Mechanical Vibration and Shock

This panel briefly reviewed previous information on vibration, blast and shock tolerances in man and animals and presented a number of new observations. Also described were new research devices that are being developed in military laboratories for study of these problems. Much systematic study in this area is still necessary before precise tolerances may be stated or meaningful generalizations formulated.

### 3. Non-Auditory Effects of Noise

This panel reported interesting positive effects on the vestibular system, the time sense and on evoked cortical potentials during exposure to high-intensity noise. On the other hand no effects had been demonstrated by a battery of psychological tests after exposures on the flight deck of aircraft carriers. Again, not enough information is available to permit the development of generalized formulations or quantitative exposure tolerances.

### 4. Ear Protection

Generalization of the critical features and theoretical limitations of ear protectors were previously reported in the BENOX Report, and more recently by Zwislocki. This panel summarized experience with the evaluation of ear protectors in the laboratory and in the field, described specific new developments and refinements in ear protectors, and described new design approaches that have been suggested by the mechanisms underlying the theoretical limitations of ear protectors. Although comfort, user acceptance, and reliability

under field conditions still leave much to be desired, recent improvements have been substantial.

#### 5. Conservation of Hearing

This panel reported on the activities of three CHABA Working Groups (21, 22, and 25) and on related activities of the Subcommittee on Noise in Industry. In particular, the panel called attention to several features recommended by the Working Groups for the new Air Force Regulations AFR 160-3 and to the forthcoming revision of the "Guide for Conservation of Hearing in Noise" of the Subcommittee on Noise in Industry.

#### 6. Noise Sources and Suppression

This panel reported on the acoustic specification of military noise sources, the mechanisms of noise generation in these sources and the methods being used for the control of noise from these sources. The amount of information about noise source characteristics is approximately proportional to the length of time particular sources have been in use. Complete and generally useful information is available for many of them, and work is progressing on most of the others. Studies of the mechanisms of noise generation within sources for the purposes of reducing noise production lags, but is proportional both to experience with the source and to the apparent need for such studies. Progress in stationary sound suppressors has been great; but portable, or in the case of aircraft power plants, flyable, suppressors present more complex problems and may require indirect and/or compromise solutions.

### Summary of Working Group Activities

#### WORKING GROUP 22

#### "Criteria for Hazardous Noise Exposures"

Status: Active

Requested by: Captain Edward H. Headley (MC) USA of the Environmental Health Laboratory, Army Chemical Center, by letter forwarded to the Council by Major Albrite on 15 April 1955. Modified by Council action to a joint Armed Services request on 5 Dec. 1955.

Purpose: To distinguish a hazardous from a non-hazardous noise exposure.

Membership:

C. I. Barron  
Aram Glorig  
Gordon Hoople  
Wayne Rudmose  
H. Schuknecht

Walter A. Rosenblith, Chairman

Air Force:

J. C. Carmichael, Lt. Col. (MSC)  
H. von Gierke  
Karl Kryter  
R. F. Thompson, Major  
C. M. Moss, Lt. Col (MC)

Army:  
R. Cramer  
John R. Hall, Col. (MC)  
Lee H. Miller, Capt. (MC) \*  
R. Edwin Shutts

Navy:  
John F. Hyland  
J. Siegel, Cdr. (MSC)  
J. Webster

Meetings: 26 October 1955, Washington, D.C.  
11-12 December 1955, Cambridge, Massachusetts  
10 June 1956, Cambridge, Massachusetts  
30 October 1956, Washington, D.C.

Activities:

At the 10 June meeting Mr. Edward Poth and 1st Lt. Carl Weinberg of the Air Force Industrial Hygiene Section at Kelly AFB recommended the adoption of a unit of noise exposure (NEU). This unit is defined as a noise exposure equivalent to one minute at a sound pressure level of 100 db. In a prolonged discussion of the pros and cons of this concept a subcommittee was appointed having the task of formulating, in a memorandum, the consensus that had been reached. The subcommittee agreed upon two new terms, Equivalent Exposure Time (EET) and Limiting Equivalent Exposure Time (LEET) and, using this new terminology, reformulated previously accepted criteria. Computational methods were suggested in order to present examples of the calculation of EET for various types of noises in the presence or absence of protective equipment.

Bu Med Instruction 6260.6 "Hearing Conservation Program" was reviewed by the Working Group. The Group recommended that the Navy, in revising this document, make use of the material developed by the Working Group for the Air Force.

The Working Group also reviewed and commented favorably, in general, on BuShips Report 371-N-27 "Noise Level Limits for the Avoidance of Deafness in Shipboard Machinery Spaces."

At the 30 October meeting the Working Group reviewed the problem of special criteria for noises having pure tone components. It was agreed that different criteria would not be necessary, provided that the programs designed to control noise exposure when pure tone components are suspected are to be made mandatory at levels of 85 db in the relevant octaves. This is in contradistinction to the recommendations for broad band noise, where such a program is recommended at 85 db/octave, and mandatory at 95 db/octave. The outline for a final report was reviewed and a writing group appointed to prepare a final draft.

Reports:

- 1) Interim Report, 1 March 1956 (AFR 160-3 material)

Major Conclusions:

The criteria for long term hazardous noise exposures given in Volume II of the Handbook of Acoustic Noise Control, or derived from them by the equal-energy assumption for short term

\* By invitation.

exposures, are consistent with present information. These criteria should be used on an interim basis.

"WORKING GROUP 25  
"Individual Audiometric Criteria"

Status: Active

Requested by: Dr. H. O. Parrack by letter dated 10 October 1955.

Purpose: To develop criteria for using audiometric information in relation to job assignment in a noise-hazardous situation.

Membership:

	Gordon Hoople, Chairman.
Raymond Carhart	<u>Air Force:</u>
Hallowell Davis	J. C. Carmichael, Lt. Col. (MSC)
Aram Glorig	C. M. Kos
Thrift Hanks	R. M. Kraus, Lt. Col. (MC)
Ira Hirsh	C. M. Moss, Lt. Col. (MC)
John R. Lindsay	H. O. Parrack
Walter Rosenblith	
	<u>Navy:</u>
<u>Army:</u>	B. D. Casteel, Capt. (MC)
John R. Hall, Col. (MC)	J. E. Rasmussen, Lt. (MSC)
C. B. Meador, Col. (MC)	

Meetings: 20-21 November 1955, Chicago, Illinois  
9 June 1956, Boston, Massachusetts

Activities:

The Working Group reviewed a draft prepared by Dr. Davis which states, in skeleton form, the medical principles underlying the Working Group's recommendations to the Air Force regarding the disposition of hearing loss cases. The Secretariat will complete the draft of the final report in accordance with suggestions made by the Working Group. The Working Group also reviewed and approved the manner in which its recommendations had been incorporated in the reissue of AFR 160-3. Materials prepared and presented by Dr. Parrack to show how these disposition recommendations work out in actual practice demonstrate that they are practical for the time being.

The Working Group also reviewed Bufile Instruction 6260.6, "Hearing Conservation Program," and recommended the Navy consider the material in Dr. Davis' draft on medical principles (mentioned above) when revising this Instruction.

Reports:

Interim Report 1 March 1956 (AFR 160-3 material)

Major Conclusions:

1) Recommendations have been made to the Air Force regarding the medical disposition of persons showing various types and amounts of hearing loss when given audiometric tests.

2) A full report is to be based on the drafts and recommendations already prepared and approved.

WORKING GROUP 26

"Program for the Fourth Annual Meeting of CHABA."

Status: Discharged (31 October 1956)

Requested by: 6 December 1955 CHABA Council meeting.

Purpose: To plan the program for the Fourth Annual CHABA Meeting.

Membership:

	D. H. Eldredge, Chairman
W. Annis	K. Kryter
R. H. Bolt	W. D. Neff
R. S. Gales	C. P. Phoebus, Capt. (MC) USN
(J. C. Webster, Alternate)	H. O. Parrack
C. S. Gersoni, Col. (MSC) USA	

Meetings: 19 April 1956, Chicago, Illinois

Activities:

The Working Group agreed to base the program on a series of panel discussions. After polling the membership for preferred questions and panel participants, individual chairmen organized their respective panels.

Reports:

Program for the Fourth Annual Meeting, 30-31 October 1956.

WORKING GROUP 27

"Standard Method for the Measurement of the Attenuation of Ear Protectors on Artificial Ears"

Status: Discharged (7 June 1956)

Requested by: The Council, 1 March 1956

Purpose: To write a document describing a standard method for the measurement of the attenuation produced by Ear Protectors.

Membership:

J. Zwislocki, Chairman  
(Not selected)

WORKING GROUP 28

"Review of the Sociological and Socio-Psychological Aspects of the Air Force Program for Research in the Area of Community Reactions to Noise."

Status: Active

Requested by: The Council, 6 December, 1955.

Purpose: To review the Sociological and Socio-Psychological Aspects of the Air Force Program for Research in the Area of Community Reactions to Noise.

Membership:

	Edwin B. Newman, Chairman
Raymond Bowers *	Howard Page
Daniel C. Camp *	H. O. Parrack
Launor Carter *	David Rioch
Amos H. Hawley *	W. A. Rosenblith

Meetings: 19 November 1956, Chicago, Illinois  
1 February 1957, San Antonio, Texas

Activities:

In November, the Working Group reviewed the current and proposed research in this area and approved the general trend. At the February meeting the Working Group considered, in greater detail, the proposals to extend this research, and the possibility that additional research approaches may be necessary.

A final report, which will indicate the need for fundamental research in this area, is in preparation. A general plan for conducting such a research program will be discussed.

WORKING GROUP 29  
"Instrumentation for Measuring High-Intensity Noise"

Status: Active

Requested by: Captain Clifford P. Phoebus, 31 October 1956.

Purpose:

To prepare a report describing the characteristics and availability of high intensity noise generating and measuring equipment that is available either commercially or as special equipment developed by individual laboratories.

Membership:

	Leo L. Beranek, Chairman
John Hilliard	Isadore Rudnick
Elias Klein *	Vincent Salmon

Meetings: 16 November 1956, Los Angeles, California

Activities:

General plans were prepared to review the field of high intensity noise instrumentation, and methods of preparing the required report were discussed at the November meeting. A Final Report is to be submitted to the June 1957 meeting of the Council.

Reports: None

Major Conclusions: None

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WORKING GROUP 30  
"Jet Engine Noise Suppressors"

Status: Active

Requested by: Dr. H. O. Parrack, Air Force Council Representative,  
30 October 1956.

Purpose:

To review the progress made in the field of jet engine noise suppression since the submittal of Memorandum Report No. 1 by Working Group 24 in May 1956.

Membership:

	T. L. K. Smull, Chairman
Leo L. Beranek	Newell Sanders
H. E. von Gierke	P. J. Westervelt

Meetings: 26 February, Cleveland, Ohio

Activities:

The Working Group has reviewed the progress made in the field of jet engine noise suppressors since February, 1956. A draft of a report, entitled "Estimate of Performance of Jet Engine Noise Suppressors for Flight Use," is being prepared for submittal to the Council in June as the Final Report.

WORKING GROUP 31  
"Program for the Fifth Annual CHABA Meeting"

Status: Active

Requested by: The Council, 31 October 1956.

Purpose: To plan the program for the Fifth Annual CHABA Meeting to be held 29-30 October 1957.

Membership:

D. H. Eldredge, Chairman  
The planning is being conducted as a Secretariat activity.

Activities:

Several possibilities for major review presentations of problems of interest to CHABA have been explored by the Council and the Secretariat. So far, presentations on the following topics appear to be the most promising:

- a. Sonic boom
- b. Results of the ANEHIN study
- c. Problems encountered in establishing noise exposure criteria.

In addition, several Working Groups should be ready to present their final or 'nearly final' conclusions and recommendations.

Reports: None

Major Conclusions: A tentative program has been prepared for review by the Council.

WORKING GROUP 32  
"Criteria for Impulse Type Noise"

Status: Active

Requested by: Letter from Col. C. S. Gersoni dated 28 November 1956 forwarding the request of Lt. Col. Joseph R. Blair, Commander, Army Medical Research Laboratory. Modified to a joint Armed Services request on 29 January 1957.

Purpose: To distinguish between a hazardous and a non-hazardous exposure to impulse noises.

Membership:

	Walter A. Rosenblith, Chairman
Jerome R. Cox *	<u>Army:</u>
Aram Glorig	Capt. John L. Fletcher (MSC)
	Merle Lawrence
<u>Air Force:</u>	
Col. Paul A. Campbell (MC)	<u>Navv:</u>
	John Donald Harris

Meetings: 25 May 1957, New York City

Activities: Professor Rosenblith will make a verbal report to the Council at the 6-7 June meeting.

Reports: (None)

Other Activities of the Secretariat

In June, 1956, Dr. Hallowell Davis, the Executive Secretary, was designated as the CHABA representative to the new Acoustics Standards Board of the Acoustical Society of America. Dr. Davis attended the first meeting of the Board in June, 1956.

The Secretary for the Working Groups spent a large fraction of his time during the summer of 1956 on the physical problems of creating and assembling CHABA Report No. 5, "The Testing of Hearing in the Armed Services," and the "Third Annual Report." This was caused by changes in the publication and distribution policy to conform to government regulations. Considerable time has also been spent in transcribing the tapes made at the Fourth Annual meeting in October, 1957. It is hoped that this material, and the "Fourth Annual Report" will be ready for distribution during the summer.

The Executive Secretary and the Secretary for the Working Groups have selected materials from CHABA Report No. 5, "The Testing of Hearing in the Armed Services," for possible publication in the Journal of Speech and Hearing Disorders. The materials have been

\* By invitation



arranged in two articles, one entitled "What is Zero Hearing Loss?" and the other, "Problems in Military Audiometry." While both articles represent a major re-editing and summarizing of the material, the first article includes new material and an article by the Executive Secretary.

The Secretariat has carried on extensive correspondence with the editors of Noise Control and the Journal of Speech and Hearing Disorders concerning the publication of materials selected from the Fourth Annual meeting of CHABA (30-31 October, 1957). The speeches made by Major General Silas B. Hays, (MC) USA, Brigadier General Marvin C. Demler, USAF, and Rear Admiral Rawson Bennett II, USN have been printed in the May issue of Noise Control. The CHABA Statement of Purposes and Methods of Operation are also printed in the same article.

The Secretariat, aided by other C.I.D. personnel and Dr. Isadore Rudnick, has advised Colonel C. S. Gersoni on approaches to the problem of quieting an experimental blast tube now under construction at the Army Medical Research Laboratory.

On 8 November, the Secretariat and other members of the C.I.D. staff briefed Mr. A. H. Grundy of Canada on research and progress on noise problems in this country. Mr. Grundy, Engineer in Chief, Royal Canadian Navy and a member of the RCN Personnel Research Committee Working Group on Noise Problems, made an official visit for this purpose.

The Secretariat, with the consent of the Council, has suspended writing work on the "Three Year Review of CHABA Activities." Originally requested by the Council at the meeting of March, 1956, this report is no longer considered necessary.

On 4 February, 1957, the Secretariat replied to a request from the Navy Bureau of Medicine and Surgery which had been submitted through Captain C. P. Phoebus. Information was desired concerning the criteria for the amount of noise reduction that is required at the source to assure only a small risk of hearing loss for maintenance personnel whose ears are not protected. The reply contained an explanation of the form in which the desired criteria must be expressed, and included references to appropriate printed materials.

In March, 1957, the Secretariat sent technical information regarding the effects of ultrasonic waves on people, animals, and objects to Senator Church of Idaho, for transmittal to one of his constituents. The request for this information had been forwarded by Senator Church to the Congressional Liaison Office of the Department of Health, Education and Welfare, and that Department had forwarded the request to CHABA.

In April, 1957, the National Academy of Sciences referred Miss Edith Whiteman (of Pare Lorenz Associated, Inc., of 166 East 74th Street, New York City) to CHABA for information regarding the effects of noise on the brain and nervous system. The Executive Secretary prepared a reply.

In April, 1957, the Secretariat answered a request from Dr. William A. Sawyer, Medical Consultant for the International Association of Machinists, for references to technical publications concerning the effects of jet noise in the aircraft industry.

## REPORTS

The following is a cumulative list of the reports prepared and distributed by the Committee on Hearing and Bio-Acoustics.

### A. CHABA Reports:

1. "High Intensity Noise and Military Operations: An Evaluation." 25 January 1954. CHABA Report No. 1. Technical Report No. 1 to the Office of Naval Research.
2. "The Effects of Blast Phenomena on Man," by D. H. Eldredge, 1 September 1955, CHABA Report No. 3. Technical Report No. 4 to the Office of Naval Research.
3. "Noise and the Community" - The Proceedings of the Second Meeting of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics, a joint meeting with the National Advisory Committee for Aeronautics Special Subcommittee on Aircraft Noise, 25-26 October 1954. October, 1955. CHABA Report No. 4. Technical Report No. 5 to the Office of Naval Research.
4. "The Testing of Hearing in the Armed Services" - The Proceedings of the Third Annual Meeting of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics, 25-26 October 1955. 1 June 1956. CHABA Report No. 5, in preparation. Technical Report No. 8 to the Office of Naval Research.

### B. Memorandum Reports:

1. "Evaluation of Methods for Reducing Noise from Jet Engines in Flight" Report of Working Group 24. May, 1956. CHABA Memorandum Report No. 1. Technical Report No. 6 to the Office of Naval Research.
2. "Hearing Conservation Data and Procedures," Report of Working Group 21. June, 1956. CHABA Memorandum Report No. 2. Technical Report No. 7 to the Office of Naval Research.

### C. Annual Reports:

First Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1954. CHABA Report No. 2. Technical Report No. 2 to the Office of Naval Research.

Second Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1955. Technical Report No. 3 to the Office of Naval Research.

"Third Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics," 1 June 1956. Technical Report No. 9 to the Office of Naval Research.

## REPORTS NOW IN PREPARATION

### A. CHABA Reports

1. "Monitoring Audiometry and the Medical Disposition of Cases of Hearing Loss," Final Report of Working Group 25. CHABA Report No. 6. Technical Report No. 11 to the Office of Naval Research.
2. Final Report of Working Group 22. (Title not yet selected.) CHABA Report No. 7. Technical Report No. 12 to the Office of Naval Research.

### B. Annual Reports

1. "Fourth Annual Report of the Armed Forces-National Research Council Committee of Hearing and Bio-Acoustics." Technical Report No. 10 to the Office of Naval Research.

### C. Memorandum Reports

1. "Estimate of Performance of Jet Engine Noise Suppressors for Flight Use," CHABA Memorandum Report No. 3, Technical Report No. 13 to the Office of Naval Research.

## CHABA MATERIAL PUBLISHED IN JOURNALS

1. The CHABA Statement of Purposes and Methods of Operation. (To be published in Noise Control.)
2. Glorig, A., and Quiggle, R. "A Hearing Conservation Data Card." Noise Control, 1956, 6:34. (Working Group 21 collaborated in the development of this data card.)
3. "Recent Progress in Hearing and Bio-Acoustics," Fourth CHABA Meeting. The speeches of Major General Silas B. Hays, MC, USA, Brig. Gen. Marvin C. Demler, USAF, and Rear Admiral Rawson Bennett II, USN. Noise Control, 1957, 3:39-44.

## CHABA MATERIALS NOW IN PRESS

Davis, H., and Usher, J. R., Eds. "What is Zero Hearing Loss?" (To be published in the September 1957 issue of the Journal of Speech and Hearing Disorders.)

Usher, J. R., Ed. "Problems in Military Audiometry." (To be published in the December 1957 issue of the Journal of Speech and Hearing Disorders.)